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SUBJECT: US-USSR S&T AGREEMENT: SIXTH JCM: JWG REPORT
ON PHYSICS (01.08)

1. PLEASE DELIVER FOLLOWING DRAFT JWG REPORT TO ANISIMOV
AND AYKAZYAN AND REQUEST CONCURRENCE SOONEST. AN EARLIER
VERSION, ONLY SLIGHTLY DIFFERENT WAS PROVIDED TO SOVIET
SIDE DIRECTLY BY PINES IN JUNE.

2. REPORT OF THE US-USSR JOINT WORKING GROUP ON PHYSICS
TO THE SIXTH MEETING OF THE US-USSR JOINT COMMISSION
ON SCIENTIFIC AND TECHNICAL COOPERATION

I. ESTABLISHMENT OF THE WORKING GROUP

AT ITS FIRST MEETING IN MARCH ,973, THE JOINT COMMISSION
ASKED THE NATIONAL ACADEMY OF SCIENCES OF THE USA AND THE
ACADEMY OF SCIENCES OF THE USSR TO DEVELOP COOPERATION
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IN THE AREA OF PHYSICS UNDER THE SCIENCE AND TECHNOLOGY
AGREEMENT.

II. LIST OF PROJECTS

AT ITS FIFTH MEETING IN JULY 1977 THE JOINT COMMISSION

ENDORSED THE COOPERATIVE PROGRAM BETWEEN THE TWO ACADEMIES WHICH WAS TO INCLUDE WORK IN THE FOLLOWING MAJOR TOPICAL AREAS:

1. CONDENSED MATTER PHYSICS
2. RELATIVISTIC ASTROPHYSICS

IN ADDITION, SINCE THAT MEETING, THERE HAS BEEN SIGNIFICANT PROGRESS TOWARD ACTIVITIES IN THE FOLLOWING AREAS, FOR WHICH APPROVAL BY THE JOINT COMMISSION IS REQUESTED:

3. LASER INTERACTION WITH MATTER
4. PARTICLE PHYSICS
5. MATHEMATICAL PHYSICS

III. ACCOMPLISHMENTS

TWO MAJOR ACTIVITIES ORGANIZED UNDER THE AUSPICES OF THE WORKING GROUP OCCURRED IN THE SUMMER OF 1977: (1) A JOINT RESEARCH GROUP ON CONDENSED MATTER THEORY MET AT THE ASPEN CENTER FOR PHYSICS FROM JULY 4-AUGUST 23, 1977; AND (2) A JOINT RESEARCH SEMINAR ON COSMIC X-RAY SOURCES MET AT PROTVINO FROM AUGUST 15-AUGUST 30, 1977.

THE RESEARCH GROUP ON CONDENSED MATTER THEORY INCLUDED TWELVE SOVIET PHYSICISTS AND TWENTY-FIVE AMERICAN PHYSICISTS.

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PHYSICISTS. THE TOPICS ON WHICH THE PARTICIPANTS WORKED INCLUDED SUPER-FLUID HELIUM-THREE, ORGANIC CONDUCTORS, ONE-DIMENSIONAL SYSTEMS, AND ELECTRON-HOLE DROPLETS. THE COOPERATION TURNED OUT TO BE AN EXTREMELY FRUITFUL ONE, WITH SOME FIFTEEN JOINT PAPERS BEING WRITTEN OR INITIATED DURING THE EIGHT-WEEK PERIOD IN WHICH THE SOVIET GROUP VISITED THE UNITED STATES. THE PARTICIPATION BY EXPERIMENTAL PHYSICISTS IN THE WORK OF THE GROUP WAS REGARDED AS VALUABLE, AS WERE THE VISITS MADE BY THE SOVIET PHYSICISTS TO A GORDON CONFERENCE AND TO A NUMBER OF US LABORATORIES AND UNIVERSITIES DURING THEIR STAY IN THE UNITED STATES.

IT WAS DECIDED THAT IT WOULD BE DESIRABLE TO HOLD A SECOND JOINT RESEARCH GROUP MEETING IN THE USSR IN THE SUMMER OF 1979, WITH PLANNING FOR THE GROUP TO TAKE PLACE DURING 1978. AS WAS THE CASE WITH THE ASPEN RESEARCH GROUP, IT IS EXPECTED THAT ARRANGEMENTS FOR THIS RESEARCH GROUP, INCLUDING SPECIFIC TOPICS AND PARTICIPANTS, WILL BE JOINTLY AGREED UPON AT LEAST SIX MONTHS IN ADVANCE OF THE MEETING.

AT THE JOINT RESEARCH SEMINAR ON COSMIC X-RAY SOURCES IN PROTIVNO THIRTEEN AMERICAN ASTROPHYSICISTS DISCUSSED WITH TWENTY-FIVE LEADING SOVIET ASTROPHYSICISTS SUCH TOPICS AS PULSATING X-RAY BINARY SOURCES, GLOBULAR CLUSTERS, X-RAY BURSTERS, GRAVITATIONAL COLLAPSE, AND ACCRETION ONTO WHITE DWARFS AND MAGNETIC NEUTRON STARS. IN ADDITION TO FRUITFUL AND PRODUCTIVE DISCUSSIONS ON RECENT OBSERVATIONS AND THEORETICAL DEVELOPMENTS, THE PARTICIPANTS, WHO INCLUDED BOTH OBSERVERS AND THEORISTS, CONSIDERED A NUMBER OF POSSIBLE JOINT RESEARCH PROJECTS IN RELATIVISTIC ASTROPHYSICS AS WELL AS EXPERIMENTAL PROJECTS INVOLVING EITHER US OR SOVIET SATELLITES.

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IT WAS AGREED TO ORGANIZE A VISIT BY TWELVE SOVIET ASTROPHYSICISTS TO THE UNITED STATES IN THE SUMMER OF 1978, A VISIT WHICH WOULD INCLUDE THEIR PARTICIPATION IN A SECOND JOINT US-USSR RESEARCH SEMINAR ON RELATIVISTIC ASTROPHYSICS, TO BE HELD AT THE ASPEN CENTER FOR PHYSICS FROM AUGUST 28 TO SEPTEMBER 8, 1978. PLANNING FOR THIS VISIT, NOW SCHEDULED FOR JULY 9 - SEPTEMBER 14, 1978, IS WELL ADVANCED. THE SOVIET PARTICIPANTS HAVE BEEN SELECTED AND THE US ORGANIZERS OF THEIR VISIT HAVE ARRANGED FOR THEM TO ATTEND AT LEAST TWO ADDITIONAL WORKSHOPS (ON AUASARS AND ACTIVE GALACTIC NUCLEI AND ON SOURCES OF GRAVITATIONAL RADIATION) AS WELL AS VISITS TO A NUMBER OF US CENTERS ACTIVE IN ASTRONOMY AND ASTROPHYSICS. THE THEME OF THE ASPEN JOINT RESEARCH SEMINAR WILL BE CURRENT PROBLEMS IN RELATIVISTIC ASTROPHYSICS, WITH TOPICS CHOSEN FROM THE AREAS OF RELATIVITY THEORY, COSMOLOGY, NEUTRINO PHYSICS AND STELLAR COLLAPSE, AND X-RAY ASTRONOMY.

IN THE FALL OF 1977, AT A PLANNING MEETING IN MOSCOW BETWEEN SOVIET AND AMERICAN RESEARCHERS INTERESTED IN LASER-MATTER INTERACTIONS, THE PARTICIPANTS AGREED THAT JOINT RESEARCH IN THIS AREA WOULD BE USEFUL AND IT WAS PROPOSED TO ORGANIZE A WORKSHOP ON THIS TOPIC IN THE USSR IN THE SUMMER OF 1978. PLANNING FOR THIS WORKSHOP, NOW SCHEDULED FOR APPROXIMATELY AUGUST 24 - SEPTEMBER 1, 1978, IS ALSO WELL ADVANCED. THE SOVIET AND US ORGANIZERS HAVE AGREED THAT THE MEETING WILL BE PRIMARILY CONCERNED WITH ABSORPTION AND TRANSPORT PHENOMENA AND HAVE AGREED UPON A LIST OF SOME SIXTEEN US AND TWENTY SOVIET PARTICIPANTS.

IN THE PERIOD JUNE - SEPTEMBER 1977 SEVERAL MEETINGS WERE

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HELD IN THE USSR BETWEEN INTERESTED SOVIET AND US RESEARCHERS TO EXPLORE THE POSSIBILITY OF JOINT RESEARCH IN THE AREA OF PARTICLE PHYSICS. AS A RESULT, A US ORGANIZING COMMITTEE PROPOSED THAT TWELVE SOVIET HIGH ENERGY PHYSICISTS PARTICIPATE IN A JOINT RESEARCH GROUP ON THE DYNAMICS OF NON-ABELIAN GAUGE FIELDS IN ASPEN DURING THE SUMMER OF 1978. BECAUSE INSUFFICIENT TIME WAS ALLOWED FOR ADVANCE PLANNING, IT BECAME CLEAR THAT MANY OF THE PROPOSED SOVIET PARTICIPANTS COULD NOT ATTEND. IT IS THEREFORE PROPOSED TO RESCHEDULE THE MEETING OF A JOINT RESEARCH GROUP ON THIS TOPIC FOR THE SUMMER OF 1979 AT THE ASPEN CENTER FOR PHYSICS.

IN THE SPRING OF 1978 SOVIET AND AMERICAN RESEARCHERS IN THE FIELD OF MATHEMATICAL PHYSICS DISCUSSED THE POSSIBILITY OF JOINT RESEARCH IN THIS AREA AND CONCLUDED THAT IT WOULD BE DESIRABLE TO SPONSOR A SERIES OF JOINT SYMPOSIA. IT IS PROPOSED THAT A FIRST JOINT SYMPOSIUM, WHICH WILL DEAL WITH SOLITONS AND RELATED NON-LINEAR PHENOMENA, BE TENTATIVELY SCHEDULED FOR SUMMER 1979.

AMONG OTHER POSSIBLE CATEGORIES FOR INCLUSION IN THE WORKING GROUP'S PROGRAM ARE SUPERFLUID HELIUM FOUR, BIOMOLECULAR PHYSICS, PROPERTIES OF MATTER UNDER EXTREME CONDITIONS (WHICH MIGHT INCLUDE TOPICS RANGING FROM THE ANOMALOUS STATES OF HYDROGEN TO POSSIBLE ANOMALOUS STATES OF NUCLEAR MATTER AND THE STATES OF MATTER INSIDE NEUTRON STARS) AND AN EXPERIMENTAL COLLABORATION ON SYNCHROTRON RADIATION. THESE AND OTHER POSSIBILITIES WILL BE EXAMINED IN THE COURSE OF EXPLORATORY INDIVIDUAL VISITS IN THE LATTER PART OF 1978 AND IN 1979.

IV. SUMMARY

COOPERATION CONTINUES TO DEVELOP SUCCESSFULLY TOWARD ORGANIZING JOINT RESEARCH IN A NUMBER OF CRITICAL AREAS.

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SUCH COOPERATION IS MUTUALLY ADVANTAGEOUS AND HAS LED TO THE ADVANCEMENT OF RESEARCH AREAS OF MUTUAL INTEREST WHILE ELIMINATING SOME DUPLICATION OF EFFORT IN THE TWO COUNTRIES. THE ACCOMPLISHMENTS OF THE RESEARCH GROUP AND RESEARCH SEMINAR MEETINGS IN 1977 PROVIDE CONCRETE EVIDENCE OF THE FRUITFULNESS OF COLLABORATION BETWEEN THE SCIENTISTS OF THE TWO COUNTRIES. THE HIGH SCIENTIFIC LEVEL OF

THE PARTICIPANTS IN THESE SOVIET-AMERICAN RESEARCH GROUPS, AND IN THOSE PLANNED FOR 1978 AND 1979, LEADS TO THE EXPECTATION THAT THE WORK OF THESE GROUPS WILL MAKE A SUBSTANTIAL CONTRIBUTION TO SOLVING SOME OF THE MOST IMPORTANT PROBLEMS OF MODERN PHYSICS.

V. RECOMMENDATIONS

IT IS RECOMMENDED THAT THE JOINT COMMISSION APPROVE CONTINUATION OF JOINT RESEARCH IN THE AREA OF PHYSICS BY THE NATIONAL ACADEMY OF SCIENCES OF THE USA AND THE ACADEMY OF SCIENCES OF THE USSR. ANTICIPATED ACTIVITIES INCLUDE JOINT SYMPOSIA, JOINT RESEARCH SEMINARS, JOINT SUMMER RESEARCH GROUPS, AND DEVELOPMENT OF JOINT RESEARCH PROGRAMS VIA CAREFULLY PLANNED SHORT-TERM VISITS BY SENIOR SCIENTISTS AND LONG-TERM VISITS BY JUNIOR SCIENTISTS. IT IS EXPECTED THAT THE FIELDS COVERED WILL INCLUDE THE ALREADY APPROVED FIELDS OF CONDENSED MATTER PHYSICS AND RELATIVISTIC ASTROPHYSICS, AS WELL AS THE FIELDS OF LASER INTERACTION WITH MATTER, PARTICLE PHYSICS, AND MATHEMATICAL PHYSICS, FOR WHICH JOINT COMMISSION APPROVAL IS REQUESTED. IT IS ALSO POSSIBLE THAT EXPLORATORY WORK WILL TAKE PLACE ON ONE OR SEVERAL OTHER PROBLEMS WHICH MEET THE JOINTLY ESTABLISHED CRITERIA OF THE TWO ACADEMIES FOR JOINT RESEARCH (PROBLEMS OF GREAT PRACTICAL IMPORTANCE UNCLASSIFIED

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OR FUNDAMENTAL INTEREST FOR WHICH AMERICAN AND SOVIET SCIENTISTS HAVE TAKEN THE LEADING ROLE IN WORKING TOWARD THEIR SOLUTION AND ON WHICH THERE HAS BEEN CONSIDERABLE PRIOR COMMUNICATION VIA SYMPOSIA OR OTHER MEANS). VANCE

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